What is claimed is:

1. An antenna array system, comprising:

an antenna array which includes a plurality of antenna elements;

a signal detection section which detects base station signals including desired signals and interference signals from among received signals received by the respective antenna elements;

a control section which selects one or more desired signals and one or more interference signals to be cancelled from detected signals;

a spatial signature detection section which detects spatial signatures of the desired signals and the interference signals to be cancelled from the received signals;

a virtual-signal generation section which generates one or more virtual-signals, the number of which is equal to the number of interference signals to be cancelled, based on the spatial signature of the interference signals to be cancelled;

an array weight generation section which generates array weights for the respective antenna elements based on the virtual-signals and the spatial signatures of the desired signals; and

a signal combining section which performs weighting for the received signals received by the respective antenna elements using the array weights and combines the weighted received signals to output a resultant combined signal.

2. An antenna array system according to claim 1, wherein the control section selects the desired signals and the interference signals to be cancelled based on signal levels of the detected signals.

3. An antenna array system according to claim 1, wherein the spatial signature detection section detects signal phases at the respective antenna elements as the spatial signatures.

4. An antenna array system according to claim 1, wherein the array weight generation section generates the array weights for the respective antenna elements by performing multiplication of an inverse matrix of a correlation matrix of the virtual-signals by the respective spatial signatures of the desired signals and by combining the results of the multiplication.

5. An antenna array system according to claim 1, wherein the spatial signature detection section detects the spatial signatures by performing correlation operations between the received signals and a spreading code which has been generated locally.

6. An antenna array system according to claim 1, further comprising a scaling section which adjusts amplitudes of the spatial signatures output from the spatial signature detection section so that the adjusted amplitudes fall within a predetermined range.

7. An antenna array system according to claim 1, wherein the virtual-signal generation section generates signals which are uncorrelated with each other as the virtual-signals.

8. A mobile terminal, comprising the antenna array system according to claim 1.

9. A mobile terminal, comprising the antenna array system according to claim 2.

10. A mobile terminal, comprising the antenna array system according to claim 3.

11.. A mobile terminal, comprising the antenna array system according to claim 4.

12. A mobile terminal, comprising the antenna array system according to claim 5.

13. A mobile terminal, comprising the antenna array system according to claim 6.

14. A mobile terminal, comprising the antenna array system according to claim 7.

15. A method of controlling the directivity pattern of an antenna array comprising a plurality of antenna elements which is provided in an antenna array system which combines received signals received by the respective antenna elements to output a combined signal, the method comprising:

a signal detection step which detects base station signals including desired signals and interference signals from the received signals;

a control step which selects one or more desired signals and one or more interference signals to be cancelled from detected signals;

a spatial signature detection step which detects spatial signatures of the desired signals and the interference signals to be cancelled from the received signals;

a virtual-signal generation step which generates virtual-signals, the number of which is equal to the number of interference signals to be cancelled, based on the spatial signatures of the interference signals to be cancelled;

an array weight generation step which generates array weights for the respective antenna elements based on the virtual-signals and the spatial signatures of the desired signals; and

a signal combining step which performs weighting for the received signals using the array weights and combines the weighted received signals to generate the combined signal.